THE ACOUSTIC TRACT.

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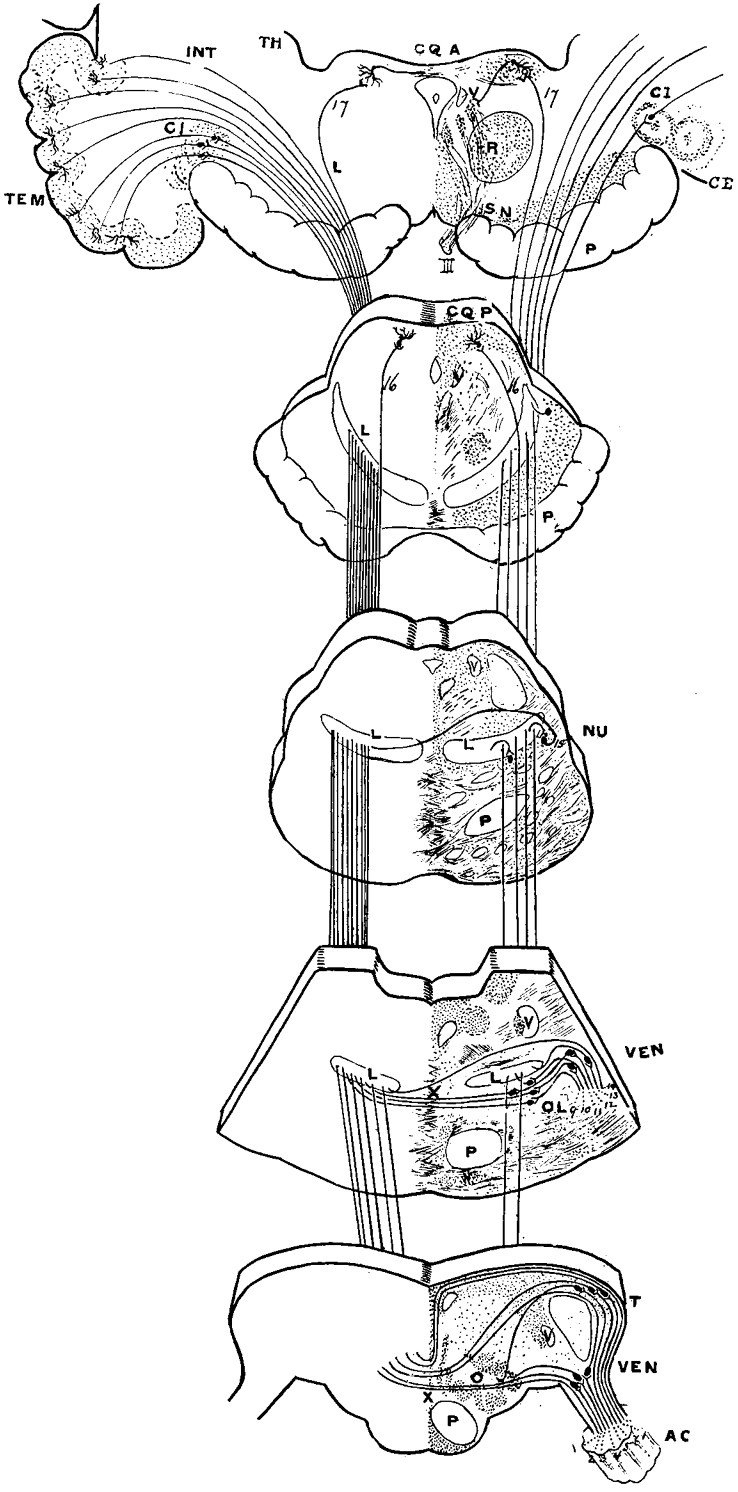
Diagram of the Auditory Nerve—Cochlear division.

The central connections of the cochlear division of the auditory nerve, the portion of the eighth nerve concerned in true auditory impressions, are shown in the diagram.

The neurone-bodies of which these fibers are the axones lie in the spiral canal of the cochlear.

AC, the acoustic nerve fibers, enter the side of the medulla in a large trunk. We can distinguish fourteen different sets of fibers. Many of these fibers (1-8) penetrate the medulla opposite the entrance of the nerve. Others (9-14) turn upward on entering, and penetrate the pons at a little higher level. These various fibers pass to different destinations; 1 crosses through the olive, turns upward in the interolivary tract and enters the opposite lemniscus, and passes up in it; 2 terminates about a neurone-body in the ventral nucleus (VEN). From this body an axone arises which crosses to the opposite side and turns upward in the lemniscus; 3 terminates about a neurone-body in the ventral nucleus (VEN). From this body an axone arises which passes upward in the lemniscus of the same side; 4 terminates about a nerve-body in the ventral nucleus (VEN). From this body an axone arises which passes about the outer side of the medulla through the tuberculum acusticum (T) and thence through the formatio reticularis of the medulla to the raphé, where it crosses to the opposite side and turns upward in the the lemniscus; 5 terminates about a neurone-body in the dorsal nucleus or tuberculum acusticum (T). From this body an axone passes through the formatio reticularis into the lemniscus of the same side and turns upward in it; 6 terminates about a neurone-body in the dorsal nucleus (T). From this body an axone passes through the formatio reticularis, crosses in the raphé and enters the lemniscus of the opposite side, turning upward in it; 7 terminates about a neurone-body in the dorsal nucleus T. From this body an axone passes across the floor of the fourth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ventricle in the striæ acusticæ to the raphé, turns downward in it, crosses to the other side, enters the lemniscus and turns upward in it; 8 passes through the dorsal nucleus into the striæ acusticæ and accompanies 7 in its course.

The ventral nucleus of the auditory nerve consists of a long column of cells which extend upward into the pons. Hence in a section through the lower half of the pons the ventral nucleus is still visible (VEN) and the fibers ascending from the auditory nerve trunk to terminate in or to pass through this nucleus (fibers 9-14) are easily traced. The course and ending of these fibers is as follows:

No. 9 turns inward and ends about a neurone-body lying in the upper olivary nucleus (OL). From this body an axone arises which crosses the median line in the trapezium, enters and ascends in the opposite lemniscus: 10 terminates about the neurone-body in the ventral nucleus, whence a new axone arises and passes to the olivary nucleus, terminating about a neurone-body there. From this neurone-body an axone arises which joins 9 and pursues the same course; 11 passes through the ventral neucleus and ends about a neurone-body in the mass of gray matter lying adjacent to but ventral of the lemniscus, and dorsal of the olivary nucleus. This is the trapezoid nucleus. From its neurone-bodies axones arise, some of which enter the lemniscus of the same side, but many of which cross the median line to enter the lemniscus of the opposite side and ascend in it; 12 terminates in the ventral nucleus about a neurone-body. This body sends its axone to the collection of neurones lying within the deep transverse fibers of the pons, the trapezoid body. These neurone-bodies in turn send their axones into the lemniscus of the same and of the opposite side; 13 terminates about a neurone-body in the ventral nucleus. The body sends an axone directly into the lemniscus of the same side; 14 passes through the ventral nucleus and crosses in the trapezoid from the opposite side, where it turns upward in the lemniscus.

It is thus evident that all the fibers of the acoustic nerve, so far as its cochlear division is concerned, transmit their impulses into the lemniscus of the same or of the opposite side.

The trapezoid fibers may be termed the acoustic decussation or chiasm, and, as in the optic chiasm, the majority of the fibers cross to the opposite side (X). The termination of fibers ascending in the lemniscus is very complex. (a) Some fibers terminate about the cells of the nucleus lemnisci in the pons (Nu) which nucleus in turn sends axones to the corpora quadrigemina of the same and of the opposite side (15). (b) Some fibers terminate about the large quadripolar cells of the porterior corpus quadrigeminum (16) (CQP). (c) Some fibers terminate about the large cells of the first layer of cells in the anterior corpus quadrigeminum (17) (CQA). (d) Many fibers terminate about neurone-bodies in the corpus geniculatum internum (C I), whence new axones arise which pass to the cortex of the temporal lobe (TEM). (e) Some fibers pass directly through the internal capsule from the lemniscus to the temporal lobe.

Since each of the nuclei in which lemniscus fibers terminate is connected with motor mechanisms as well as with the cortex of the temporal lobe, it is evident that the auditory impulses can awaken numerous reflex and automatic acts as well as conscious sensations of hearing. Hence the act of turning eyes and head or assuming postures of strained listening and other automatic acts are made possible by these fibers.

The diagram shows that the connection of each ear is with both sides of the brain, but that the crossed connection is more extensive than that with the same side. The diagram does not show the existence of a corresponding set of neurones whose axones pass in the direction the reverse of those shown. Degenerative changes after experimental injuries prove their existence. Hence a second diagram might be drawn showing axones of exactly complementary course. These are omitted from this diagram for the sake of clearness.